

C o m i t é d u P l a n c t o n

Par M.-L. FURNESTIN

1969

Belgium

I. Station de Pêche Maritime - Ostende (R. De Clerck)

Report on the activity of Belgium during 1969

Studies on zoo- and phytoplankton distribution off the Belgian coast were carried out - especially in relation to the disposal of domestic and industrial waste water.

II. Institut Royal des Sciences Naturelles de Belgique (E. Leloup)

Programme pour 1970

Une étude du phyto- et zooplancton débutera, au large de Nieuport, en 1970 et sera poursuivie en 1971.

Canada

(L.M. Dickie)

Atlantic plankton productivity studies

Work is in progress on the occurrence, production and role of non-living organic matter in food chains. Attention is also being given to the development of biochemical indicators (specifically DNA, RNA and ATP) of biomass and production rate of both phytoplankton and zooplankton. In another continuing study the three-year average of annual production by phytoplankton in St. Margaret's Bay is $190 \text{ gC/m}^2 \cdot \text{yr}$. An index based on the degree of optical attenuation due to photosynthesis has proved to be a useful predictor of primary production. Most of the variance in this index can be explained by changes in chlorophyll concentration. A self-contained in situ radiometer for measurement of submarine light energy in absolute units has been developed to further these studies. Initial studies have been completed on the relationship between heterogeneity of phytoplankton distribution and complexity of the physical environment. The relationship between energy flow and plankton species diversity in St. Margaret's Bay has also been studied.

Laboratory studies have been made on the growth feeding and metabolism of the pteropods Clione limacina and Spiratella retroversa which have a unique predator-prey interaction in the plankton community and form the top two links in a specialised food chain. It is an excellent opportunity to measure growth efficiency and food chain efficiency. Studies have continued on the distribution of herring larvae in relation to environmental factors in the Gulf of St. Lawrence and on the Scotian Shelf.

Pacific plankton productivity studies

During the past two years a co-operative programme has been developed for the study of production processes in the subarctic North Pacific Ocean. The programme is expected to last for an initial period of five years. The primary purpose is to examine components of oceanic variability which may affect commercial fisheries (e.g. high seas salmon mortality) and further to assess the productivity and diversity of organisms having potential value as a food resource for man. The principal agencies in this co-operative programme are the Fisheries Research Board of Canada, Nanaimo, and the Department of Oceanography University of Washington, Seattle.

This programme was initiated with a transpacific cruise from Esquimalt, B.C. to Tokyo for the purpose of studying environmental parameters for use in production models. The follow-up to this programme is a continuing study of the subarctic North Pacific using data collected from American Mail Line vessels.

Arctic plankton productivity studies

A marine ecology study in Frobisher Bay (63°40'N, 68°27'W) has been underway for a little more than two years, conducted by the Arctic Biological Station of the Fisheries Research Board of Canada. From carbon-14 studies primary production by phytoplankton was estimated as 93 g carbon per m² for the year 1969, which may be interestingly compared with an estimated value of 53g carbon per m² for 1968. Annual variation in time of melting of snow cover from the sea ice surface appears to be a major contributor to this difference. The herbivorous zooplankton shows an approximately 10-fold increase between winter minimum and summer (August) maximum, varying in dry weight from about 250 to 2500 mg per m².

Denmark

(E. Steemann Nielsen)

I. 'Danmarks Fiskeri- og Havundersøgelser'

Kattegat: Measurements of the primary production and sampling of zooplankton with 8-liter water bottles were continued from the light vessels "Anholt Nord", "Aalborg Bugt" and "Halsskov Rev".

Although quite high production rates were measured both at "Anholt Nord" and "Halsskov Rev" they were somewhat smaller than in 1968.

North Sea: The identification has been initiated of fish larvae and fish eggs in samples collected by means of the Gulf III sampler and the Hensen net in the North Sea during the summer months 1969.

In continuation of investigation of production of microbenthos in the Wadden Sea by the late Dr. Grøntved, measurements have been made of the content of organic matter in the sediments. These measurements have been made every two weeks in connection with investigations on the feeding biology of the lugworm, Arenicola marina.

The large material concerning the organic production by the microbenthos in the Wadden Sea left over by the late Dr. Grøntved has been prepared for publication.

A few samples were taken outside the Wadden Sea in order to check the abundance of a naked flagellate, tentatively identified as Gymnodinium breve. In late October 1969 35 000 per liter were counted 5 miles west of the island of Rømø.

Programme for 1970

The bi-monthly plankton observations made from the three Danish light vessels will be continued. The work on the taxonomy of Danish fish larvae and fish eggs will continue. Likewise studies on the production in the Wadden Sea will be carried on; based on experimental work.

II. 'Grønlands Fiskeriundersøgelser'

West Greenland. In the Davis Strait 53 stations were operated for hydrographical observations and macro-plankton hauls (stramin net, ring diameter 2 m, oblique hauls from about 50 m depth) from February to September on four standard EW sections, off Frederikshåb, Godthåb, Sukkertoppen, and Holsteinsborg. At the permanent station in the entrance of Godthåb Fjord 5 similar samples were taken.

Displacement volumes of the plankton samples were measured, and fish eggs and larvae were sorted and counted.

Distribution of cod eggs and larvae will be presented in the ICNAF Redbook (Danish Research Report 1969).

Programme for 1970

Similar plankton investigations will be made on the same stations and with the same methods in 1970.

France

(M.-L. Furnestin)

I. Travaux de l'Institut des Pêches maritimes, Laboratoire de Nantes

a) Mer du Nord et Manche

Recherche des larves de hareng dans le sud de la Mer du Nord et dans la Manche orientale (automne 1968 et 1969).

b) Golfe de Gascogne

- Etude des communautés indicatrices sur le plateau continental et au large (Chaetognathes, Méduses, Siphonophores, Salpes et Doliolles).
- Interprétation des analyses volumétriques de plancton total prélevé dans le Golfe entre les années 1964 et 1968.
- Étude des Clupéidés (oeufs et larves) en 1968-69 et relations avec les conditions hydrologiques.

Les résultats ont fait l'objet d'une publication dans la Revue des Travaux (1970, fasc.1) et de deux communications au CIEM, 1969.

c) Méditerranée

Zooplankton de prélèvements mensuels dans les étangs de Diane et Urbino (Corse) en 1969.

Programme pour 1970

a) Golfe de Gascogne

- Étude volumétrique des récoltes de 1970 (plancton total).
- Étude des communautés planctoniques au large du Golfe (suite).
- Synthèse de l'étude des oeufs et larves de Clupéidés recueillis dans le Golfe de 1964 à 1969.
- Poursuite de l'examen de l'ichthyoplancton sur les récoltes de 1970 (identification, étude quantitative par espèce et relations avec les conditions hydrologiques).

b) Méditerranée

Poursuite de l'étude du zooplankton des étangs de Corse.

II. Travaux des laboratoires conchylicoles de l'I.S.T.P.M.

Les études régulièrement effectuées depuis plusieurs années ont été poursuivies sur les sujets suivants:-

- les larves des mollusques comestibles et leur évolution;
- les fluctuations du microplancton en fonction des conditions hydrologiques des divers centres d'élevage de coquillages; des résultats intéressant la région de Morlaix ont été publiés (Rev.Trav.Inst.Pêches marit., 33(3) "Le microplancton des rivières de Morlaix et de la Penzé", pp. 311-332, G. Paulmier);
- le verdissement des huîtres dans les claires de la région de Marennes qui a fait l'objet d'une nouvelle publication dans la Rev.Trav. Inst.Pêches marit., 33(3), pp. 333-342 "Introduction aux recherches sur les substances hydro-carbonées et lipoprotéiques dans les claires à huîtres et sur leur relation éventuelle avec la pigmentation de Navicula ostrearia B." (J. Moreau), ainsi que de 3 communications au CIEM, 1969.

Programme pour 1970

Les observations porteront sur le même programme.

III. Travaux du Laboratoire de Biologie animale (Plancton). Faculté des Sciences, Marseille

Poursuite des recherches mixtes Hydrologie - Plancton dans la zone de remontée de la bordure cantabrique, d'après des pêches verticales (200-0 m) effectuées en 1968 par "La Thalassa" (Institut des Pêches maritimes). Compte-rendu à Dublin: "Plancton de l'upwelling ibérique. II Observations complémentaires sur les Chaetognathes" (M.-L. Furnestin et Ch. Allain).

Suite des investigations sur le plancton profond de l'Atlantique européen (en collaboration avec I.S.T.P.M.). Compte-rendu à Dublin: "Remarques écologiques sur quelques pêches planctoniques profondes des côtes atlantiques ouest-ibériques" (J.P. Casanova).

Programme pour 1970

Plancton de l'upwelling de la bordure cantabrique: Ptéropodes, Euphausiacés et autres groupes.

Plancton profond de l'Atlantique européen: inventaire complet et analyse écologique de 10 prélèvements au large de la Péninsule ibérique.

Inventaire d'un lot de Chaetognathes des eaux canariennes.

Germany

(J. Krey)

I. 'Institut für Meereskunde, Universität Kiel'
(J. Krey, R. Boje, A.H.V. Sarma)

The long-term observations on the productivity in the western Baltic, started in 1957, were continued during 1969. The standard observations include temperature, salinity, oxygen, phosphate, total phosphorus, seston, albumin (microbiomass), chlorophyll a, nanoplankton and net plankton of different mesh sizes.

Similar observations were carried out on several cruises to the middle and eastern part of the Baltic, combined with measurements of the primary production by means of the ¹⁴C technique.

The heterogeneity and short-term variations in the distribution of the main planktological parameters were measured during a cruise of R.V. "Anton Dohrn" in the Norwegian Sea in August.

In co-operation with the chemical department, a special investigation on the growth conditions of a phytoplankton bloom was carried out in the Kiel Bight in the early spring.

Publications

Theses

Derenbach, J. Erweiterung und Entwicklung einiger summarischer und zytologischer Methoden zur Untersuchung des Planktons in seinem natürlichen Lebensraum.
Thesis, Kiel 1969.

Schinkowski, H. Untersuchungen über den Einfluss einiger produktionsbiologischer Parameter auf die Sichttiefe in Meer.
Thesis, Kiel 1969.

- Schöne, H. Untersuchungen zur ökologischen Bedeutung des Seegangs für das Plankton mit besonderer Berücksichtigung mariner Kieselalgen. Thesis, Kiel 1969.

Other publications

- Derenbach, J. Zur Homogenisation des Phytoplanktons für die Chlorophyllbestimmung. Kieler Meeresforschungen 25(1): 166-171.
- Derenbach, J. Partikuläre Substanz und Plankton anhand chemischer und biologischer Daten gemessen in den oberen Wasserschichten des Gotland-Tief im Mai 1968. Kieler Meeresforschungen, 25(2):(in print).
- Devulder, K. Jahreszeitliche, tiefenabhängige und örtliche Veränderungen im wechselseitigen Verhältnis von Nucleinsäuren, Eiweiss und Chlorophyll in Netzplankton. Ber.Dt.Wiss.Komm.f. Meeresforschung. 20(1969) H 3/4:216-255.
- Matterne, M. Vergleiche zwischen Primärproduktion und Syntheseraten organischer Zellbestandteile mariner Phytoplankter. Kieler Meeresforschungen, 25(2): (in print).

II. 'Bundesforschungsanstalt für Fischerei - Institut für Küsten- und Binnenfischerei'

Plankton sampling for the study of the distribution of Crangon larvae in relationship to hydrographic and other factors along the German North Sea coast were continued.

Routine investigations on the plankton composition in the Elbe estuary were also continued.

Publications

- Elss, U. On the seasonal distribution of Crangon larvae on the German coast. ICES, C.M.1969/K:4 (mimeo).
- Kühl, H. & Über das Zooplankton der Unterweser und Wesermündung.
Mann, H. VIM 12, 43-64.

III. 'Biologische Anstalt Helgoland'

Investigations of the Plankton Department in 1969.

1) Starting in June 1969, quantitative phytoplankton investigations from samples taken daily by the four German lightships "Elbe 1", "P 12", "P 8" and "Borkumriff" were carried out. 4 x 110 samples were taken until the middle of September; 4 x 70 of these are being presently examined for quantitative phytoplankton content. These investigations are to be continued in the coming years from spring to autumn. In summer 1969, short (1-2 weeks) blooms of small naked flagellates occurred at different times at 3 of the 4 stations. The main biomass, however, was formed by large diatoms (mainly Eucampia zoodiacus).

The aim of these investigations is to obtain the geographical differences of phytoplankton succession and learn about the occurrence of plankton blooms in the German Bight. Together with the station "Helgoland-Reede", 5 different and typical hydrographical regions are now under control.

2) Studies on plankton standing stock and production as well as on hydrographical and hydrochemical data were continued at the station "Helgoland-Reede". Hydrographical observations were conducted daily; chemical and plankton data were collected thrice a week. In 131 samples the content of PO_4 , NO_3 , NO_2 , NH_4 , Si, Ca, Mg was analysed and the pH measured.

3) During four short cruises of the research ships "Friedrich Heincke" and "Uthörn", 130 quantitative phytoplankton samples were taken and hydrographical and chemical observations made in the German Bight.

4) During the first running of the underwater laboratory "Helgoland" (UWL) near the isle of Helgoland, sedimentation rates and composition of the sinking material were measured at the bottom at 22 m depth. 15 samples of sinking material were collected in 4 sediment traps. They represent sedimentation rates in a bottom area measuring 225 cm² within a period of 5 to 20 hours. Volume, dry weight, organic carbon and nitrogen were determined. Nine samples of the sediment surface from different bottom areas were collected and similarly analysed for C and N content. Turbidity and underwater illumination were measured at the bottom near the UWL.

Studies on zooplankton 1969

Investigations on the zooplankton for the northern Atlantic show the following patterns of distribution for oceanic Chaetognathes:-

The frequency of the mesoplanktonic species indigenous in the coolish waters (Sagitta maxima, S. decipiens, Eukrohnia hamata) increases in the areas of rising or upwelling deep water. This is the case in the centre of the cyclonic whirl in the Irminger Sea and along the left flank of the north-east Atlantic current. On the other hand, at the right of this current, epiplanktonic species are transported towards the stream axis in the surface waters by means of transverse circulation. Thus Sagitta serratodentata tasmanica is the best indicator species on the origin and spreading of the water masses of the Gulf Stream system.

The fluctuations of the neritic Sagitta elegans observed in the area off East Greenland are caused by vertical migrations of the adult specimens into deeper layers in which they are transported towards the coast and into the fjords. The new generation born there rises to the surface and is pushed seawards in the surface water of low salinity.

IV. 'Universität Hamburg - Institut für Hydrobiologie und Fischereiwissenschaft'

Participation in the programme: "Norwegian Sea 1969" (co-ordinator Prof., Dr. G. Dietrich, Kiel) with plankton investigations aboard FRV "Anton Dohrn", cruise 130a; 7-day anchor station in a test field. Studies on the microstructure of the vertical distribution of zooplankton and its relation to the daily fluctuation of the deep scattering layers in the upper 700 metres (catches with the Longhurst-Hardy plankton recorder).

V. 'Institut für Meeresforschung, Bremerhaven'

Department of botany.

Ecological investigations on lower marine planktonic fungi in the German Bay, the region between Bäreninsel and Norway and on the west coast of northern Africa. Investigations on sediment samples in the same regions were carried out and studies undertaken on the interaction between the planktonic diatom Coscinodiscus granii and its parasite Lagenisma coscinodisci Drebes. Interactions between benthic algae and their parasites in the mouth of the river Weser and in the German Bay were also studied.

Department of zoology.

Taxonomic work was conducted on Indian coastal plankton copepods. Research was carried out on zooplankton in the Weser estuary.

Iceland
(I. Hallgrímsson)

Zooplankton

Five zooplankton surveys were carried out in connection with herring investigations in Icelandic waters and the northern part of the Norwegian Sea in the period 8th May to 22nd September.

Altogether 358 zooplankton stations were worked, each station sampled by a Hensen net 50 - 0 m and "Icelandic High Speed Samplers" towed at 5 and 25 m depth.

Larvae of bottom invertebrates were collected off the south coast (Nephrops) and in the fjords of the west coast (Pandalus).

Phytoplankton

Measurements of primary production with the ^{14}C technique were carried out at 11 stations in the waters off the north-western peninsula of Iceland from 16th April to 2nd May and at 25 stations in the waters off the north and north-east coast of Iceland from 4th-10th June. The samples were taken at standard depths 0, 10, 20 and 30 m and illuminated at ca. 13 000 lux in a temperature regulated incubator. Samples for quantitative analyses of the phytoplankton were collected at each level where productivity was measured.

In connection with the shellfish catching (Pecten islandicus) in the mouth of Jökulfirðir at the north-western part of Iceland, samples for quantitative analyses of the phytoplankton were collected at the sea surface ten times in the period from 22nd June to 9th September.

In connection with sampling of Mytilus edulis in Hvalfjörður (Faxa Bay) 7 surface samples for quantitative analyses of the phytoplankton were collected in the period 1st July to 9th September

Ireland
(F.A. Gibson)

Nothing to report this year.

Italy

Netherlands
(P. Korringa)

In reports to the Demersal Fish (Northern) Committee and to the Pelagic Fish (Northern) Committee plankton work carried out by the Netherlands on the distribution and quantity of fish eggs and larvae has been recorded.

Periodical observations in the coastal water of IJmuiden to detect plankton blooms which could lead to adverse conditions for fish and shellfish were continued in 1969. The phytoplankton in the Dutch coastal waters reflected the relatively calm weather during 1969. Since the coastal water is composed of sea water diluted with Rhine water it shows a high fertility. Low wind speeds lead to precipitation of the silt carried down by the rivers, and therefore to a good penetration of the sunlight. This in its turn leads to development of considerable blooms of diatoms. The main species in 1969 were Skeletonema costatum, Eucampia zoodiacus and Chaetoceros radians. No blooms of dinoflagellates have been observed and in fact only one specimen of Goniaulax has been observed.

Norway
(F. Beyer)

University of Oslo

I. Phytoplankton surveys

a) The study of the vertical phytoplankton distribution in coastal waters with a pronounced halocline (Nordåsvatn and inner Hardangerfjord) was continued. (U. Lillemoen).

b) The investigation of the spring phytoplankton in the spawning areas for cod and herring (Møre-Lofoten) was continued; in collaboration with the Marine Research Institute, Fisheries Directorate, and part of the Norwegian IBP-PM programme. (I. Nygaard).

c) In collaboration with the University of Bergen an all-year survey of the phytoplankton of Nordåsvatn near Bergen was initiated. (K. Tangen).

II. Special phytoplankton studies

a) Taxonomic studies with the use of transmission and scanning electron microscopy were continued, on coccolithophorids (K. Ringdal Gaarder), diatoms (G. Rytter Hasle and B. Riddervold Heimdal) and microflagellates (J. Throndsen).

b) The study of Coccolithus huxleyi, its life cycle and fine structure, has been continued. (D. Klaveness). Comparative morphological and physiological studies of coccolith-bearing and naked C. huxleyi have been made. (E. Paasche, D. Klaveness).

c) Investigations on nanno-phytoflagellates have been continued. (J. Throndsen).

d) Experimental work has been initiated on changes in the content of chloroplast pigments and enzymes in plankton algae induced by different light regimes (strong and weak light, long and short days). (E. Paasche).

Publications

Braarud, T. & Heimdal, B.R.	1969	Brown water on the Norwegian coast in the autumn, 1966. <i>Nytt Mag.Bot.</i> (In press).
Gaarder, K.R.	1970	Three new taxa of Coccolithineae. <i>Ibid.</i> 17. (In press).
Gaarder, K.R.	1970	Comments on the distribution of coccolithophorids in the oceans. In: <i>The Micropaleontology of Oceans</i> , ed. B.M. Funnell and W.R. Riedel. Cambridge. (In press).
Hasle, G.R. & Heimdal, B.R.	1970	Some species of the centric diatom genus <u>Thalassiosira</u> studied in the light and electron microscopes. <i>Beiheft zur: Nova Hedwigia: Friedrich-Hustedt-Gedenkband.</i> (In press).
Hasle, G.R., Heimdal, B.R. & Fryxell, G.A.	1970	Morphologic variability in fasciculated diatoms as exemplified by <u>Thalassiosira tunida</u> (Jarnisch) Hasle comb.nov. <i>Ant.Res.Ser.</i> (In press).
Heimdal, B.R.	1970	Morphology and distribution of two <u>Navicula</u> species in Norwegian coastal waters. <i>Nytt Mag. Bot.</i> (In press).
Paasche, E.	1969	Light-dependent coccolith formation in the two forms of <u>Coccolithus pelagicus</u> . With remarks on ¹⁴ C Zero-thickness counting efficiency of coccolithophorids. <i>Arch.Microbiol.</i> 67:199-203.
Paasche, E.	1970	A simple method for establishing bacteria-free cultures of phototactic flagellates. <i>J.Cons.int. Explor.Mer.</i> (In press).

Throndsen, J.	1969	A simple micropipette for use on the Wild M 40 and the Zeiss plankton microscopes. J.Cons.int.Explor.Mer <u>32</u> :430-432.
Throndsen, J.	1969	Flagellates in the Norwegian coastal waters. Nytt Mag.Bot. <u>16</u> :161-214.
Throndsen, J.	1969	A small sedimentation chamber for use on the Wild M 40 and Zeiss plankton microscopes. J.Cons.int.Explor.Mer <u>33</u> (2). (In press).
Throndsen, J.	1969	<u>Salpigoeca spinifera</u> sp.nov., a new planktonic species of the Craspedophyceae recorded in the Arctic. Brit.phycol.J. (In press).
Throndsen, J.	1969	Flagellates from Arctic waters. Nytt Mag.Bot. <u>17</u> . (In press).
Throndsen, J.	1970	Marine planktonic acanthoecaceans (Craspedophyceae) from Arctic waters. Ibid. (In press).

Institute of Marine Research, Bergen

Phytoplankton

1) As for the previous year the situation in plankton development was analysed at the spawning fields of the Atlanto-Scandian Herring and the Arctic cod between Stadt and Vesterålen.

The study is part of a 5-years IBP-programme on the recruitment mechanism of these fish and covers taxonomic analysis, measurements of the primary production, chlorophyll-determinations and particle size frequency analysis. (G. Berge).

2) A bio-assay on effects of fertilizers upon the algae production of Fern Lake was published. (G. Berge).

Zooplankton

Sampling was continued at the permanent oceanographical stations along the coast of Norway and at Station M in the Norwegian Sea. The material is worked up continually by the "short cut" method and filed on cards.

Investigations in connection with commercial fishery for zooplankton were continued, plankton hauls being taken in the upper 30 m in fjords and coastal areas near Bergen in May-June. Inside the skerries the plankton was dominated by medusae, but in open waters Calanus finmarchicus was dominant, in concentrations up to 16 ml drained plankton per cubic metre. With a finemeshed surface trawl with an opening of 12 m², towed from a commercial fishing vessel, catches up to 85 kg per trawling hour were obtained. About 10 metric tons of Calanus were taken by other vessels.

Monthly samples of krill and myctophid fish were taken in Byfjorden near Bergen with a 3' Isaacs-Kidd pelagic trawl and the Beyer paravane-net.

Publication

Wiborg, K.F. & Björke, H.	1969	Investigations on the abundance of copepod plankton (<u>Calanus finmarchicus</u>) and experimental fishing for the same in coastal waters off Bergen, May-June 1969. <u>Fisken Hav</u> . 17-20.
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At the Biological Station, Espegrend, J.B.L. Matthews has taken up quantitative studies of the distribution and food web of the plankton in the 700 m deep Korsfjorden near Bergen. He has also been supervising a number of special zooplankton studies in the same locality, concerning the vertical distribution of Radiolaria, the annual cycle of medusae, the biology of Boreomysis, and the annual cycle and biology of euphausiids. Work is in progress on bottom-dwelling calanoid copepods in various fjords of northern Norway (A. Fosshagen).

At the Statens Biologiske Stasjon, Flödevigen, work (started in 1967) was continued on the occurrence of neuston and hyponeuston, particularly ichthyo-hyponeuston, in inshore and offshore waters (D. Danielsen & S. Tveite).

At the 'Kongelige Norske Videnskabers Selskabs Museum' Trondheim, the annual cycle of phytoplankton and zooplankton in relation to hydrography in the Trondheimsfjord was studied by E. Sakshaug and T. Strömberg.

The quantitative distribution of Goniaulax tamarensis in relation to hydrography was studied as an IBP project (E. Sakshaug). In co-operation with 'Norsk Institutt for Tang- og Tareforskning', pigments, especially carotenoids, were studied in plankton and Mytilus, which was also tested toxicologically. Toxic mussels were found in waters with Goniaulax.

At the 'Institutt for marin biologi, Avd. A', a study on regional differences and seasonal changes in the specific distribution of macroplanktonic larvae in the Oslofjord was completed, and a paper on this subject is in press. (T. Schram). Studies on the life cycle and vertical distribution of Aglantha digitale and Sagitta elegans in the inner Oslofjord were completed as master's theses (O. Smedstad, T. Jakobsen). Reports are being prepared for publication.

From the 'Marinbiologisk Stasjon, Tromsø a number of cruises were made to various fjords in Troms and Finnmark throughout the year for the purpose of collecting zooplankton in vertical hauls with a 500 μ net. The aim is to compare displacement volumes. Through the period April-June extensive use was made of Clarke-Bumpus Plankton Samplers for collecting larvae of commercially important fish in inshore and offshore waters from Trænabanken to Varangerfjorden. The results are published (P.T. Hognestad).

Publication

Hognestad, P.T.	1969	Distribution of fish larvae in north Norwegian coastal waters in spring 1969. <u>Fisken Hav</u> , 9-13.
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Poland

(W. Mańkowski)

1. In 1969 the investigations on the Baltic zooplankton were continued. For that purpose 7 cruises were made. Three of them were performed according to the plan of the so called "Baltic Year". These were not so much concerned with the southern Baltic itself as with both the western and the eastern parts of the Gotland Deep, and reached as far as the Gulf of Finland. In 1969 plankton samples were taken at in all 165 stations and the total number of samples was 796. From these, there were:-

495 samples taken by Hensen net
119 samples taken by Nansen net
182 samples taken by Copenhagen net

The samples taken by Hensen and Nansen nets have already been worked up according to the following scheme:-

The samples from the catches by Hensen net were subject to:

- 1) Measurement of plankton volume
- 2) Segregation of plankton into 3 groups:
 - a) Microplankton
 - b) Macroplankton
 - c) Fish eggs and larvae (ichthyoplankton)
- 3) Determination of wet and dry microplankton mass (by weight)
- 4) Macroplankton
 - a) Separation into species and determination of the number of individuals within each of them and recalculation for the water volume under 1 m² of sea surface

- b) Separation of the individuals of each species into 3 groups according to size (large, middle and small) and determination of their amounts, as well as of their wet and dry masses (by weight).
- 5) Determination of fish eggs and larvae with respect to species in order to learn the quantitative distribution and occurrence of eggs and larvae in the southern Baltic.
- 6) Maps of quantitative distribution of plankton biomass as well as of fish eggs and larvae have been made separately.

On the basis of plankton material from previous years some items have been worked up and published in form of contributions to ICES meetings.

2. In the North Sea and on the Celtic Shelf the investigations were carried out in June. Another cruise to the North Sea took place in October. Altogether plankton samples were taken at 77 stations as follows:-

By Hensen net	180 samples
By Copenhagen net	108 samples
By Ringtrawl	6 samples
By means of the 'HAI' apparatus	26 samples
T o t a l	<u>320 samples</u>

The material was worked up and the volumes and dry mass of zooplankton and, separately, the occurrence of fish eggs and larvae with particular respect to herring larvae were determined.

3. South Baltic adjacent waters. The Firth of Szczecin. The observations on plankton production and development as controlled by varying environmental factors were continued. Particular attention was paid to the influence of industrial wastes. In the period from May to October 60 samples were collected by Apstein net once a month. Plankton biomass, which in 1969 was particularly high, was estimated. It was stated that the development of Cyanophyceae, especially that of Microcystis and Aphanizomenon flos-aquae, was considerably intensive, presumably in connection with a strong increase in phosphat concentrations in the area concerned which for the last two years were observed to be 5 to 10 times as great as those for the years 1954-1956.

4. The shelf waters off north-west Africa. In February and June (1969) 18 samples were taken with plankton nets of Hensen and Apstein types from the waters situated between the Gambia River mouth and the parallel of 23°N. The samples were worked up with respect to distribution of fish eggs and larvae.

Programme for 1970

Observations will be continued in all the above-mentioned areas.

5. Papers presented to the 1969 Statutory Meeting of the Council are listed in Procès-Verbal 1969 (p. 93-95).

Portugal

(E. de Sousa e Silva)

Phytoplankton

- 1) Taxonomical study of Dinoflagellates from Tagus and Sado estuaries. (E.S. Silva).
- 2) Taxonomical study of Diatoms from Sado estuary (M.A. Sampaio).
- 3) Studies on life cycle of some species of Dinoflagellates in culture are being continued. (E.S. Silva).

- 4) Chromatographic and spectrophotometric studies of pigments in some species of Dinoflagellates from culture (M.E. Assis).

Zooplankton

An all-year survey of zooplankton was carried out in the estuary and mouth of Sado River (M.H. Vilela).

Publications in 1969

"The life cycle of Tisbe sp. (Copepoda Harpacticoida) under laboratory conditions", by Maria Helena Vilela - Notas e Estudos do Inst.Biol.Mar., No.36.

"Primary productivity in the Tagus and Sado estuaries from May 1967 to May 1968", by Estela S. Silva, Maria E. Assis and Maria A. Sampayo - Idem, No.37.

"Cytological aspects on multiplication of Goniodoma sp." by Estela S. Silva - Botanica Marina (Hamburg) Vol. XII, F.1-4.

Programme for 1970

Phytoplankton

- a) Net and water sampling to collect Dinoflagellates and other Flagellates for taxonomical studies and for essay of culture of different species. (E. S. Silva).
- b) The work mentioned above in 3) and 4) will be continued.
- c) Preparation of the systematic and ecological data about Diatoms from the Sado estuary, for publication (M.A. Sampayo).

Zooplankton

- a) Study of the samples caught all over the year 1969, in Sado estuary (M.H. Vilela).
- b) Studies on life cycle of some species of Copepods maintained in Culture (M.H. Vilela).
- c) Oblique net sampling at a station off the mouth of Sado river for collection of fish larvae and eggs.
- d) Essay to keep some bivalves larvae under laboratory conditions, to follow their development.

Spain

Sweden

(A. Lindquist)

West coast

Investigations on the occurrence of fish eggs and larvae have been continued. In April it was possible to catch numerous elvers in the archipelago of Bohuslän; the elvers were attracted by light during the night. It is not known yet in detail which way the elvers take during their immigration into the Baltic. In October a survey for herring larvae was carried out in the Kattegat (part of an international programme). Big quantities of Tima bairdi during January and February and during the autumn hampered prawn fishing in the Skagarrak.

Baltic

Numerous samples have been taken for investigations on the occurrence of fish eggs and larvae as well for zooplankton in general in the Baltic. The zooplankton material has been worked up and will be published soon. Experimental work on ichthyoplankton has been prepared.

The regular measurement of primary production (C-14) from the light vessel "Finngrundet" was discontinued as the light vessel was withdrawn. Some measurement of primary production has been made during the hydrographic expeditions of the "Baltic Year".

United Kingdom

1. England and Wales

(D.H. Cushing)

Work on the plaice larvae in the Southern Bight has continued. In particular a series of cruises was carried out for and by the Hydrographic Section to study diffusion with respect to the plaice larvae specifically. The material on the plaice larvae in earlier years can now be expressed as loss rate in eggs and in larvae. A study of Oikopleura and Fritillaria is nearly complete. A certain amount of gear work has been completed and an error in the expression of density (when a flow meter is being used) has been detected; but it does not occur in the work emanating from Lowestoft.

2. Scotland

(J.H. Fraser)

Aberdeen

Plankton surveys were undertaken throughout most of the year by the Scottish research vessels in sea areas adjacent to Scotland and in the inshore waters.

Surveys were carried out in the northern North Sea in February, March, April, June, July, September, October and December; Faroe-Shetland area in June/July and November; Rockall in April and October; inshore east coast areas in May, October and November and inshore west coast areas in February/March, April, May, August, November and December. Samples were also taken in Loch Ewe, Loch Fyne and Loch Tay.

Plankton work from the Aberdeen laboratory has been on the following lines, similar to those in 1968:-

- a) Plankton and its relation to the general environment and the fisheries (zooplankton J.H. Fraser, phytoplankton D.D. Seaton).
- b) Routine collection of zooplankton standing crop data from the northern North Sea and west coast waters. Biomass and dry weight (J.A. Adams), chlorophyll a (J.A. Adams and I.E. Baird).
- c) Herring-plankton relationships in the northern North Sea (J.A. Adams).
- d) Plankton of the Rockall area (J.H. Fraser and D.D. Seaton) and larval fish (R.S. Bailey).
- e) Study of problems associated with handling and behaviour of plankton nets, particularly high speed samples (J.A. Adams).
- f) Food and distribution of predatory species in the Scottish area, particularly medusae (J.H. Fraser).
- g) Plankton populations in inshore lochs (N.T. Nicoll).
- h) Sampling of autumn spawned herring larvae in the area 57°-59°30'N to 0°-4°W in September (A. Saville).
- i) Plankton associated with pollution in general (J.A. Adams and D.D. Seaton) and with pulp mills (J.H. Fraser).
- j) Phytoplankton of a mussel cultivation area (Linne Mhuirich) with a view to the prediction of toxic blooms (D.D. Seaton).

Programme for 1970

Most of the work done in 1969 will continue in 1970. An attempt will be made to assess the food supply of larval herring in the Ballantrae Bank spawning area.

Edinburgh (G.A. Robinson)

The survey by Continuous Plankton Recorder, operated from the Oceanographic Laboratory was continued in 1969 on the same basis as in other years. Recorders are towed at a depth of ten metres, at monthly intervals, along a number of standard routes. The standard routes of the survey are shown in the Administrative Report of the Hydrography Committee. During the year Recorders were towed by ships of seven nations for 115 162 miles in the North Atlantic Ocean and the North Sea. This work was supported by the Natural Environment Research Council and through Contract No. F61052-67-C0091 between the Scottish Marine Biological Association and the Office of Naval Research, Department of the United States Navy.

The Edinburgh Laboratory also continued the study of the distribution of the plankton in relation to the herring fishery off the north-east coast of Scotland. Samples were taken nightly throughout the fishing season from April to September.

U.S.S.R.

(A.F. Karpevich)

In 1969 data on zooplankton were collected in the Norwegian and Barents Seas. The surveys in the Norwegian Sea in the areas of spawning and feeding of adult herring were carried out from March to August inclusive. In the Barents Sea plankton was collected along the route of larval drift from Lofoten area to the Kola section in the east and to 74°30'N from mid-April to mid-July. Phytoplankton samples were taken in the Norwegian Sea. Collecting of macroplankton samples concerning the characteristics of distribution and abundance of Euphausiidae was conducted in the autumn-winter period in the Barents Sea. The number of samples collected is shown in the table below:-

<u>Area of Sampling</u>	<u>No. of samples</u>
1. The Norwegian Sea, areas of spawning and feeding of adult herring (zooplankton)	1 830
2. The Norwegian Sea (phytoplankton)	502
3. The Barents Sea, along the route of larval drift (zooplankton)	1 366
4. The Barents Sea (macroplankton)	160

In 1970 the investigations which were started earlier will be continued in connection with calculation of the production of the main kinds of zooplankton in the Norwegian Sea, and investigations on phytoplankton will also be continued. As in previous years we may collect zooplankton samples along the route of larval drift for the investigations on food resources of larvae of commercial fish.